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TRANSMITTAL OF APPEAL BRIEF (Large Entity)

Docket No.
770-010704-USPAR

In Re Application Of: **Y. Lam et al.**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
10/006,752	11/8/01	D. Petkovsek	2512	2874	2535

Invention: **AN OPTICAL COUPLING MOUNT**

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

APPLICANT(s):	Lam et al.		
SERIAL NO.:	10/006,752	ART UNIT:	2874
FILING DATE:	11/8/01	EXAMINER:	D. Petkovsek
TITLE:	AN OPTICAL COUPLING MOUNT		
ATTORNEY DOCKET NO.:	774-010704-US(PAR)		

Board of Patent Appeals and Interferences
United States Patent and Trademark Office
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APPELLANTS' BRIEF

(37 C.F.R. 1.192)

This is an appeal from a final rejection of the claims in the above-identified application. A Notice of Appeal was mailed on September 24, 2004.

I. REAL PARTY IN INTEREST

The real party in interest in this Appeal is Nanyang Technological University.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences regarding this application.

III. STATUS OF CLAIMS

Claims 1 and 12 have been cancelled.

Claims 2 through 11 are pending in the application.

Claims 2 through 11 are finally rejected.

The claims on appeal are claims 2 through 11.

IV. STATUS OF AMENDMENTS

No amendments have been made to the application subsequent to final rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Claim 3 recites an optical bench 1, 31 for coupling light between an optical device 2, 35 and an optical fibre 32 (page 4, line 1; Figure 1 and page 5, line 12; Figure 7). The optical bench 1, 31 has at least a portion of unitary construction (page 4, lines 9-12) comprising an integral optical spot size converter (page 4, line 2; Nos. 3, 20, Figures 1; and Nos. 33-34, Fig. 7), and optical alignment means (Page 4, lines 7-8; No. 9 in Figure 1)(page 5, lines 15-16, and 26; Nos. 48 in Figure 8 and 58 in Figure 9) for fixing the position of an initially separate optical device (page 4, line 6; No. 2 in Figure 1) relative to the optical spot size converter 3, 20 so that, in use, light is coupled between the optical device 2 and the optical spot size converter 3, 20. The spot size converter 3, 20 comprises a pair of waveguides (page 4, lines 13-24; Nos. 21, 24 in Figures 2, 3A

and 3B). At least one of the waveguides 21, 24 is dimensioned to cause light to couple from one waveguide to the other as light propagates along the length of the waveguide (page 4, line 33 to page 5, line 1); Figures 3A-3B and 4A-4B).

Claim 4 recites an optical bench 1, 31 for coupling light between an optical device 2, 35 and an optical fibre 32 (page 4, line 1; Figure 1 and page 5, line 12; Figure 7). The optical bench 1, 31 has at least a portion of unitary construction (page 4, lines 9-12) comprising an integral optical spot size converter (page 4, line 2; Nos. 3, 20 in Figures 1 and 2; and Nos. 33-34 in Figure 7), and optical alignment means (page 4, lines 7-8; No. 9 in Figure 1; (page 5, lines 15-16, 26; Nos. 48 in Figure 8 and 58 in Figure 9) for fixing the position of an initially separate optical device 2 (page 4, Line 6; No. 2 in Figure 1) relative to the optical spot size converter 3, 20 so that, in use, light is coupled between the optical device 2 and the optical spot size converter 3, 20. The spot size converter 3, 20 comprises an upper waveguide 4, 24 having a reducing lateral taper along at least part of its length, vertically spaced a distance above a non-tapering lower waveguide 6, 21 (Page 4, Lines 3-5; Figure 1 and Page 4, Lines 15-21; Figure 2).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 2 through 11 stand rejected under 35 U.S.C. 103(a) as being obvious over Zhou et al. (U.S. 2003/0044118) in view of Lee (U.S. Patent 6,411,764).

VII. ARGUMENT

a) Claims 2-3 and 6-11

Claim 3 recites that the optical bench has at least a portion of unitary construction comprising an integral optical spot size converter and optical alignment means (for fixing the position of an initially separate optical device relative to the optical spot size converter. In other words, the portion of unitary construction of the optical bench has both an integral optical spot size converter and optical augment means. Neither Zhou et al. (U.S. 2003/0044118) nor Lee (U.S. Patent 6,411,764) either alone or in combination disclose or suggest the features recited in claim 3.

In Fig. 6, Zhou discloses an optical system with an optical device 620, waveguide coupling 610 and optical fiber 630. In Fig. 6 Zhou fails to disclose an optical bench, and merely discloses the individual components (optical device 620, waveguide coupling 610 and optical fiber 630) of a system for coupling light between the optical device 620 and fiber 630. None of the components in Fig. 6 are an optical bench. Zhou discloses an optical bench in Fig. 3, the bench supporting an optical fiber end and an optical device (laser diode). Clearly, however, the optical bench in Fig. 3 of Zhou however, does not have an integral optical spot size converter as called for in claim 3 (the fiber end being formed into a lens so that more light may be captured by the fiber). In paragraph 31, Zhou further discloses a silicon optical bench (SiOB) on which V-grooves are wet-etched to guide the mounting or placement of photonic components including fibers, lenses and semi-conductor chips. Clearly, Zhou does not expressly disclose the bench having unitary construction comprising an integral optical spot size

converter and optical alignment means for fixing an initially separate optical device relative the spot size converter.

The Examiner however, argues that it would have been obvious for one skilled in the art to take the individual components disclosed in Fig. 6 (laser 620, coupler 610 and fiber 630) of Zhou and mount one or more using V-grooves to an SiOB as per paragraph 31. This argument is not correct, because Zhou itself (in paragraph 25 for example) identifies the difficulty of integrating a spot size converter with the optical device due to the large differences in their coefficients of thermal expansion and mechanical stabilities. Nevertheless, even if one or more of the individual components (laser 620, coupler 610 and fiber 630) were to be mounted on the SiOB, as argued by the Examiner, this would still be different from the features called for in claim 3. Mounting individual components such as an optical coupler to a SiOB using V-grooves as disclosed in Zhou, results in an assembly of two or more distinct (previously separate) parts. Such an assembly of individual parts is not the same as an optical bench with at least a portion of unitary construction comprising an integral optical spot size converter and optical alignment means for fixing an initially separate optical device relative to the spot size converter as called for in claim 3.

The Examiner appears to concede, that indeed Zhou does not expressly disclose the bench having unitary construction comprising an integral optical spot size converter and optical alignment mean (for fixing an initially separate optical device relative to the spot size converter). Nevertheless, the Examiner further argues that it would have been (per se) obvious from Zhou alone, without more, for one skilled in the art to modify Zhou and make the optical bench of unitary construction having

integral optical spot size converter and optical alignment means. The Examiner's argument is that it would have been obvious to one skilled in the art, simply from the bare disclosure (Fig. 6) in Zhou of an optical system with a coupling 610 (having a spot size converter) between an optical device 620 and optical fiber 30, and the disparate disclosures of a bench (Fig. 3) used for direct butt-joining a fiber (with a lens) to a laser, and of a V-groove on SiOB (to guide mounting of photonic components, paragraph 31) to integrally wed the optical coupling and V-groove system into a unitary portion of the bench. This argument is incorrect, at least for the reason that, as noted before the bench in Fig. 3 has no optical coupling mounted thereto, (the lens is mounted directly onto the end of the optical fiber not the bench). Neither Fig. 3 nor Fig. 6, nor any other portion in Zhou provide any motivation or suggestion (that the combination is even possible or will be successful) to modify the bench in Fig. 3 by providing it with a portion of unitary construction having both integral optical spot size converter and optical alignment means.

Lee also fails to disclose or suggest any of the features recited in claim 3.

Lee is concerned with a planar optical device having an integrated spot size converter, and the spacing of the lower waveguide from the upper waveguide is in part dictated by the need for the lower waveguide not to impact on the active region of the upper waveguide, which forms the optical device. Nowhere does Lee disclose or suggest an optical bench with a portion of unitary construction comprising both integral optical spot size converter and optical alignment means as called for in claim 3.

It is further noted, that the result of the structure called for in claim 3 is to provide a new solution to the known problems

associated with the accurate coupling of light between an optical device and fiber, whilst allowing the device/fiber to be tested independently of the coupling means which facilitates their mutual optical alignment. An optical bench, with integral spot-size converter and alignment means, can be manufactured independently of the device/fiber, and the precise form of spot-size converter and alignment means can be tailored according to the device/fiber specifications. The features of the optical bench recited in claim 3 give rise to a simple integrated optical coupling solution, which can be optimised, fabricated and tested independently of the optical device and optical fibre to be coupled, and which has alignment means for simple subsequent assembly of the device and fibre.

As neither Zhou, nor Lee disclose or suggest the features recited in claim 3, the combination of Zhou and Lee cannot provide features that are neither disclosed or suggested. Claims 2-3 and 6-11 are patentable over the cited prior art and the rejection should be reversed.

Claims 4 and 5

Claim 4 calls for an optical bench having at least a portion of unitary construction comprising an integral optical spot size converter and alignment means for an optical device. Further, claim 4 recites that the spot size converter comprises an upper waveguide, having a reducing lateral taper along at least part of its length, vertically spaced a distance above a non-tapering lower waveguide. This is not disclosed or suggested in either Zhou or Lee. Zhou and Lee fail to disclose or suggest an optical bench with a portion of unitary construction comprising an integral optical spot size converter and alignment means. At most, Zhou discloses individual photonic components (Fig. 6) that

are individually mountable to an optical bench (Fig. 3) which is very different from an optical bench having at least a portion of unitary construction comprising an integral optical spot size converter and alignment means, as is called for in claim 4. Lee, for its part fails to cure the defect in Zhou. Lee discloses a stand alone spot size converter (SSC). In Lee, there is absolutely no mention of an optical bench with a portion of unitary construction and the spot size converter being integral to the portion of unitary construction as otherwise called for in claim 4. In further contrast to Lee, the SSC called for in claim 4 comprises an upper waveguide having a reducing lateral taper along at least part of its length, vertically spaced a distance above a non-tapering lower waveguide. The Examiner argues that the vertical spacing of two waveguides is disclosed in the SSC taught by Lee. However, Lee is concerned with a planar optical device (not an optical bench coupling an optical device to optical fiber) having an integrated spot size converter. Hence, in Lee the spacing of the lower waveguide from the upper waveguide is in part dictated by the need for the lower waveguide not to impact on the active region of the upper waveguide that forms the optical device. This is not so with the integral SSC in an optical bench as called for in claim 4. There is simply no suggestion or motivation from Lee and Zhou (or any other reference cited by the Examiner) to make it obvious to one skilled in the art to combine these references as argued by the Examiner. It is also noted that the upper waveguide of Lee's SSC converter tapers vertically not laterally. The design requirements and motivation of Lee's present integrated device-SSC are thus different to those of the present invention, where the SSC is independent of the optical device to be coupled to it.

Here again, the passages cited by the Examiner from Zhou merely serve to emphasize the state of the art and the problems associated with coupling light between a planar optical device and an optical fibre. Conventional solutions involve integrating a SSC with the optical device (as per Lee) and providing means to align to an optical fibre or else some form of independent optical bench with alignment means on which the separate optical device, SSC and fibre may be individually mounted. None of the cited prior art teaches or renders obvious an optical bench with a portion of unitary construction having an integrated SSC and alignment means for optical device as recited in claim 4.

It is further noted, that the result of the structure called for in claim 4 is to provide a new solution to problems associated with the accurate coupling of light between an optical device and fiber, whilst allowing the device/fiber to be tested independently of the coupling means which facilitates their mutual optical alignment. This is not merely a matter of design choice as the Examiner argues. An optical bench, with a portion of unitary construction having an integral spot-size converter and alignment means, can be manufactured independently of the device/fiber, and the precise form of the spot-size converter and alignment means can be tailored according to the device/fiber specifications. The optical bench with the features recited in claim 4 provided a simple integrated optical coupling solution, which can be optimised, fabricated and tested independently of the optical device and optical fibre to be coupled, and which has alignment means for simple subsequent assembly. Furthermore, the SSC taught in the present invention can readily be optimised for a variety of devices and fibres by suitable adjustment of SSC parameters, including waveguide dimensions, spacing and taper.

Neither Zhou nor Lee disclose or suggest the features recited in claim 4, and hence the combination of Zhou and Lee cannot provide, features that are not disclosed or suggested in either reference. Claims 4-5 are patentable over the cited prior art and should the rejection of claim 4 based on Zhou and Lee should be reversed.

The claim appendix is attached hereto. A check in the amount of $340 is enclosed herewith for the appeal brief fee. The Commissioner is hereby authorized to charge payment for any additional fees associated with this communication or credit any over payment to Deposit Account No. 16-1350.

Respectfully submitted,

11/24/04

Janik Marcovici
Reg. No. 42,841

Date

Perman & Green, LLP
425 Post Road
Fairfield, CT 06824
(203) 259-1800
Customer No: 2512

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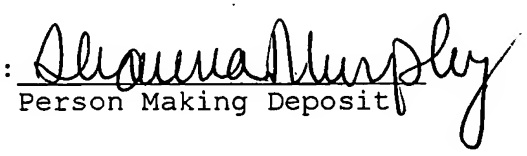
Signature: 
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APPENDICES

VIII. CLAIM APPENDIX

The text of the claims involved in the appeal are:

1. (Canceled).

2. An optical bench according to claim 3, formed of a silicon material.

3. An optical bench for coupling light between an optical device and an optical fibre, the optical bench having at least a portion of unitary construction comprising an integral optical spot size converter and optical alignment means for fixing the position of an initially separate optical device relative to the optical spot size converter so that, in use, light is coupled between the optical device and the optical spot size converter wherein the spot size converter comprises a pair of waveguides, at least one of which is dimensioned so as to cause light to couple from one waveguide to the other as light propagates along the length of the waveguide.

4. An optical bench for coupling light between an optical device and an optical fibre, the optical bench having at least a portion of unitary construction comprising an integral optical spot size converter and optical alignment means for fixing the position of an initially separate optical device relative to the optical spot size converter so that, in use, light is coupled between the optical device and the optical spot size converter, wherein the spot size converter comprises an upper waveguide having a reducing lateral taper along at least part of its length, vertically spaced a distance above a non-tapering lower

waveguide.

5. An optical bench according to claim 4, in which the upper waveguide and lower waveguide are separated by a cladding region.

6. An optical bench according to claim 3, in which the optical alignment means is adapted to receive the optical device.

7. An optical bench according to claim 3, in which the optical alignment means is keyed for engagement with the optical device.

8. An optical bench according to claim 3, in which the optical alignment means comprises at least one trench in the optical bench within which the optical device is to be located and one or more alignment grooves or ridges that cooperate with corresponding alignment ridges or grooves, respectively, formed on the optical device.

9. An optical bench according to claim 3, further comprising an integral V-groove dimensioned to allow for the location of an optical fibre adjacent a facet of the spot size converter.

10. An optical assembly comprising an optical bench according to claim 3, in combination with an optical device located on the optical bench, and an optical fibre, each of the optical device and the optical fibre being aligned with the spot size converter to provide coupling of light between the optical device and the optical fibre.

11. An optical assembly according to claim 10, in which the optical device is a semi-conductor edge emitting waveguide device.

12. (Canceled).

IX. EVIDENCE APPENDIX

Not Applicable

X. RELATED PROCEEDINGS APPENDIX

Not Applicable